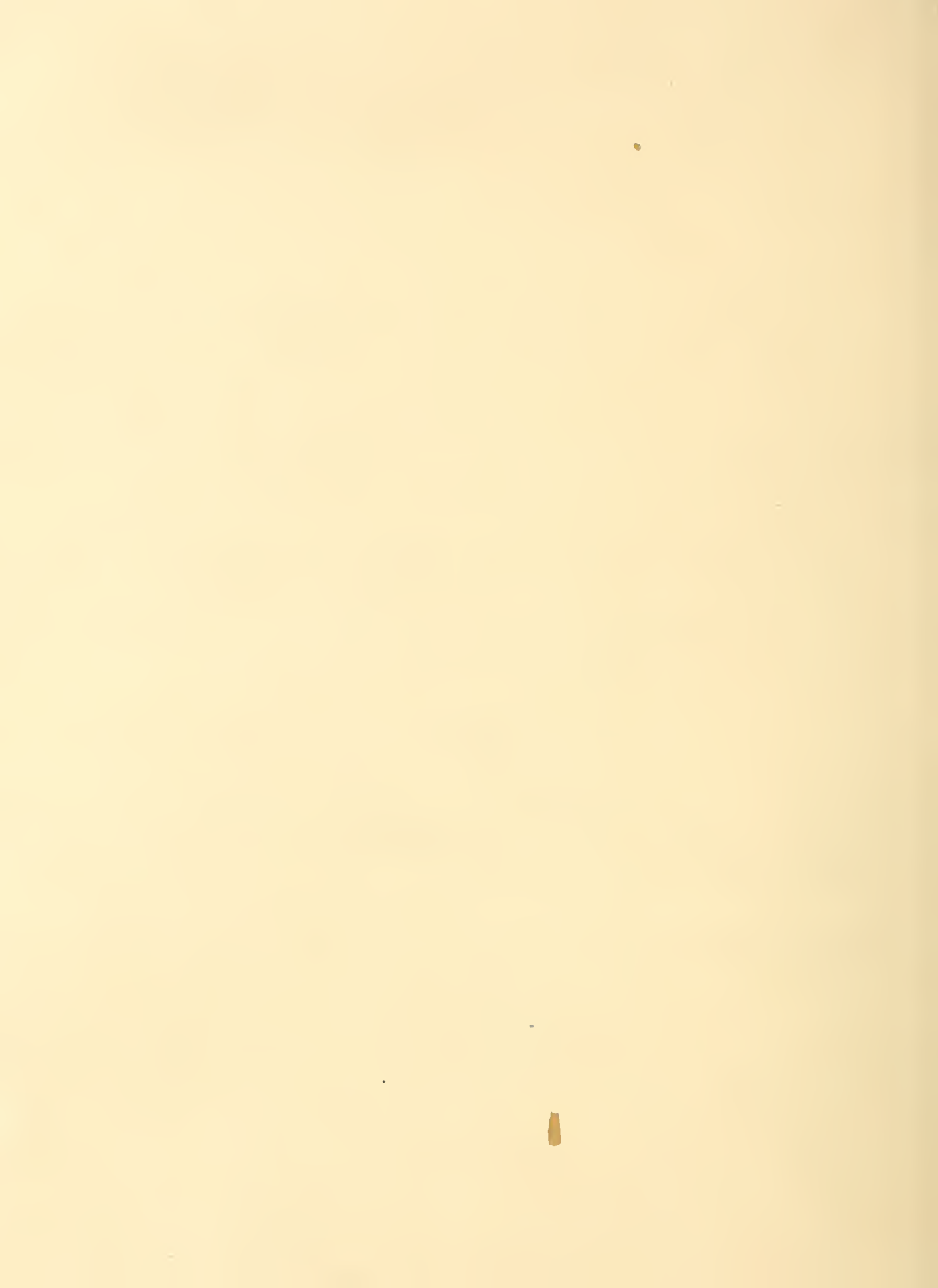


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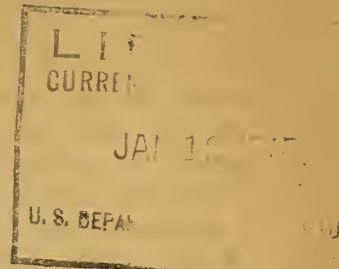


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UNITED STATES DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports\*  
for  
SOIL CONSERVATION SERVICE RESEARCH\*\*

OCTOBER 1944



EROSION CONTROL PRACTICES DIVISION

Conservation Experiment Stations Section

J. B. Pope of Tyler, Texas reports: "Crop Yields Low in 1944.- Due to adverse weather conditions, the corn, cotton, and oat yields in our three-year cropping system this year were unusually low in comparison to some of the more favorable years of the past. However, the comparative yield differences were significantly higher from the rotation plots than on comparable areas of the same crops not in a rotation. The percentage differences were as follows: corn yield increase of 87 per cent, cotton increase of 21 per cent, and oats 33 per cent. The average yields of the different crops in the three-year cropping system were 30.5 bushels of corn, 340 pounds of seed cotton, and 23.4 bushels of oats per acre. The average yields of these crops on the check areas were 16.3 bushels of corn, 280 pounds of seed cotton, and 17.6 bushels of oats. This study has been under way since 1940 and these comparisons represent cumulative results."

Hugh C. McKay of St. Anthony, Idaho reports: "In the winter wheat seeding trials on the various plowing methods there is differences in the stand and growth of wheat. There was sufficient moisture near the surface in all types of plowing to be able to seed before fall rains occurred. The best stand of wheat was obtained on the one way disc plowing, followed closely by the moldboardless plow and the modified rod weeder. The moldboard plowing gave the poorest stand and growth. This was true for both the single disc and deep furrow drills. There is no apparent reason for the poorer stand for the moisture was just as good as in the other methods of initial tillage. The modified rod weeder plots have a large amount of cheat grass growth on them."

"A very good stand of wheat was obtained on the field tilled with the John Deere sweep machine; it was seeded with a deep furrow drill."

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\*\*All Research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

"In the sweet clover plots plowed at three different dates, the stand of wheat varies according to the date of plowing with the best stand occurring on the early plowing and the poorest on the late plowing. A very poor stand was obtained on the moldboardless late plowing plots. There was considerable sweet clover residue on the surface making it hard to seed through. A better stand of wheat was obtained on the straight sweet clover plots than on the sweet clover and grass plots."

F. L. Duley of Lincoln, Nebraska reports: "There has been damage on some of our plots due to chinch bugs moving in from corn on fall seeded wheat. This is the second year this has occurred, and this year many farmers have reported similar trouble. The Department of Entomology has been working with us, and we have kept the bugs reasonably well under control."

"Another entomological problem has been the damage by the northern corn root-worm. On land where corn has been on the land continually for six years over 90 per cent of the stalks are leaning over or down due to damage to the roots. Fall plowing reduced slightly the damage, but it was still serious. Where corn followed wheat or soybeans there was practically no damage. Rotation of crops, therefore, seemed to be an effective method of control of this corn root-worm."

Dwight D. Smith of Columbia, Missouri reports: "Field tests of contoured corn were conducted and samples harvested from 19 fields in 10 counties on 9 soil series. Yields this year were quite erratic, being affected by excess rainfall last spring during corn planting season. The average contour yield was 58.0 bushels per acre, in comparison to 52.5 bushels per acre from up-and-down-hill planted corn. This is an increase of 5.5 bushels per acre or 10.5 per cent in favor of contouring."

C. J. Whitfield of Amarillo, Texas reports: "Research studies of the factors determining success in the use of chemical sprays for killing mesquite.-A summary of the experience gained the past two years with the leaf sprays for killing mesquite indicates that they may be used with a high degree of success under certain conditions and with little or no chance of success under others. A detailed analysis of the limiting factors has indicated that they may be divided into three divisions, namely, (1) the characteristics of the chemical such as its toxicity, hygroscopicity, concentration and ability to penetrate and move within plant tissue; (2) the external factors such as absolute humidity, temperature, wind, rate of evaporation, available soil moisture, precipitation during or soon after spraying, the occurrence of dews following spraying, and light; (3) the morphological and physiological condition of the plant at time of spraying, particularly the presence of a water deficit, degree of leaf maturity, amount of leaf surface, structure and physiology of the leaves, particularly the distribution of stomata, their number, size and degree of maturity, and the general character of the epidermis of the leaves."



"Of the many factors which have been studied so far, the external factors which appear to be of the most importance are precipitation or heavy dew either during spraying or within three days following spraying. In all cases where successful results have been secured with chemical sprays, either a heavy dew or precipitation has occurred within three days after spraying.

"In an attempt to determine when these conditions are most likely to occur, an analysis of hygrothermograph records covering the growing seasons for the period October 1943 to the end of October 1944 was made. The number of days on which moderate to heavy dews occurred were counted with the results shown in the following table:

Number of Days per Month When Moderate to Heavy Dews Occurred at the Taylor Ranch near Vega, Texas

Season	Number of days per month -							
	April	May	June	July	August	Sept.	Oct.	Total
1943	-	-	-	-	-	-	9	9
1944	2	2	2	4	3	3	5	21

"These results indicate a total of 21 days during the growing season of 1944 when the external conditions were favorable for spraying mesquite sprouts. Since over one-half of these 21 days occurred after August 1 and since sprout leaves reach full maturity about August 1, it appears that, in general, the most favorable spray season would be late summer and early fall.

"In an effort to increase the chances of success under unfavorable external conditions, exploratory tests using various hygroscopic agents in the sprays have been tried. The use of sulfuric acid to increase the rapid penetration of various chemicals is under test and shows promise under some conditions. No final results are yet available."

R. E. Dickson of Spur, Texas reports: "Grazing trials from April 15 to October 31, 1944 with 30 head of yearling Hereford steers show that pastures where the brush was mowed with a power saw produced an average steer gain of 295 pounds per head. While pastures left in medium heavy mesquite brush produced an average steer gain of 270 pounds per head. The average daily gain per head was 1.41 and 1.29 pounds for the mowed and unmowed brush pastures, respectively."

C. S. Slater of College Park, Maryland reports: "Some very preliminary tests were made at Dr. Nichols' suggestion to determine the extent to which partial protection against surface sealing (this is a typical stubble mulch condition) allowed soils to take in water at their full infiltration capacity. It was inferred from the results of the test that partial surface protection may be very nearly completely effective as long as sufficient surface is protected to insure an infiltration at the surface which is greater than the permeability of some lower zone within the soil profile."

T. W. Edminster of Blacksburg, Virginia reports: "With the end of the runoff season from pasture land it is possible to summarize the runoff data from the contour pasture furrow study. This is done in the two following tables. During the three years of the experiment there has been a consistently higher runoff from the fertilized plots over and above untreated plots. There has been no apparent logical reason for this. On the other hand the decreased runoff from fertilized and furrowed plots may be attributed to the more rapid revegetation of the furrow scars.

YEARLY RUNOFF FROM PASTURE PLOTS

Treatments	1942				1943				1944			
	No. rains	Tot. rain-fall	In. rain-fall	Pct. run-off	No. rains	Tot. rain-fall	In. rain-fall	Pct. run-off	No. rains	Tot. rain-fall	In. rain-fall	Pct. run-off
Untreated	16	16.02	3.66	7.62	11	13.77	6.32	15.30	3	4.87	1.48	30.39
Fertilized	16	16.02	5.25	11.26	11	13.77	7.58	18.35	3	4.87	2.48	50.99
Furrowed	16	16.02	0.67	1.40	11	13.77	2.82	6.81	3	4.87	0.59	12.18
Fert. and furr.	16	16.02	0.58	1.22	11	13.77	1.66	4.01	3	4.87	0.33	6.77

THREE YEAR SUMMARY OF PASTURE PLOT RUNOFF

Treatment	Total number of rains causing runoff	Total inches of rainfall causing runoff	Total inches of runoff	Per cent of rainfall that ran off
Untreated	30	34.66	11.46	33.06
Fertilized	30	34.66	15.31	44.17
Furrowed	30	34.66	4.08	11.77
Fert. and furr.	30	34.66	2.57	7.41

The above tables were taken from the report by T. W. Edminster.

George W. Hood of Batesville, Arkansas reports: "A day was spent inspecting our cooperative field trials on the establishment of Bermuda grass from seed. To say that we were well pleased is putting it mildly. We visited the farms of W. A. Cozart and F. O. McMullen of Pleasant Plains; Mr. V. Jeffort and M. L. Webb of Floral and Mr. C. E. Fraser of Oil Trough. In all, nine different fields were examined ranging in size from 1/2 acre to 7 acres. These fields ranged from 3 per cent to 7 per cent slope. Some fields had been old pastures with no grass remaining and some were virgin soil where timber had just been cut. In only one case was there a failure of the seed. Seven out of the nine fields had excellent stands; one had sufficient plants to make a solid sod with next year's growth and one field was a near failure due to heavy rain just after the seed was sown. All fields had been grazed this fall. The rate of seeding varied from two to four pounds per acre, but in all cases good stands were present. It was impossible to determine any difference in stands from the light or heavy seedings and no doubt two pounds are sufficient. All fields had been plowed and disked and three had been ridged. The seed was sown, broadcast and not covered. On those fields which had been packed by rain before seeding the best stands were observed and where seed was sown on loose seed bed the stands were poorer.



"From these trials and observations it would appear that two pounds of clean Bermuda seed, sown on top of the soil, on a well prepared seed bed with the surface packed by rain or rolled, will produce good stands.

"The Bermuda grass seed was purchased for \$1.00 a pound. This would make a cost per acre of \$2.00 to \$4.00 which is considerably cheaper than establishing stands by vegetative methods and far more practical for the average farmer."

H. L. Borst of Zanesville, Ohio reports: "The ladino seed harvest was the second made from this area this year. The first harvest netted about 35 pounds of seed per acre. The second will approach, if not equal, this amount. At the present price of around \$2.60 per pound, the production of ladino seed appears to be highly profitable.

"Corn yeilds for the contour vs. up-and-down the slope culture test were computed and are as follows:

Rows up-and-down slope			Contour rows		
Plot No. <u>1/</u>	Grain <u>2/</u>	Fodder <u>3/</u>	Plot No. <u>1/</u>	Grain <u>2/</u>	Fodder <u>3/</u>
	<u>Bu.</u>	<u>Lbs.</u>		<u>Bu.</u>	<u>Lbs.</u>
2	64.6	4111	3	59.1	3875
4	46.9	3385	5	66.5	3861
7	51.5	3330	6	67.4	3679
10	51.9	2965	9	76.0	4294
Average	53.8	3448	Average	67.2	3927

1/ Plot area - 1/74 acre. 2/ Shelled corn at 15 per cent moisture.  
3/ Fodder at 20 per cent moisture.

"With the idea of eliminating, insofar as possible, soil fertility as a limiting factor, 500 pounds per acre of ammonium sulphate was plowed under and 400 pounds per acre of 3-12-12 was applied in the row. The contour rows were cultivated with a damming cultivator."

Harley A. Daniel of Guthrie, Oklahoma reports: "There are several regrassing experiments under way at the Guthrie Station but on one particular study little bluestem was seeded in 1943 on heavy semi-permeable, severely sheet eroded soil. A portion of this area was planted with seed-hay and the other with threshed seed. The rate of seeding per acre was the same with both methods. However, there were 1,500 pounds of native grass or mulch applied on the surface of the land on the seed-hay plots. This material was pressed into the soil by rolling with a culti-packer or disc harrow. The results in the following table show that the seed-hay method produced a density of grass which was 2.54 times greater than that from the threshed seed.

Method of seeding <u>1/</u>	Density of stand (per cent)		
	1943	1944	Average
Seed hay <u>2/</u> .....	7.38	9.44	8.41
Threshed seed.....	2.92	3.70	3.31
Native grass <u>3/</u> .....	8.13	7.08	7.61

"1/ Amount of seed applied per acre was the same with both methods.

2/ Mulch, 1500 pounds per acre. 3/ Includes all palatable perennial grasses.

"By the end of the second growing season, the density of the grass on the seed-hay areas was about the same as that of virgin native grass. For eroded spots or gullied land, the seed-hay method is proving to be very practical."

Harold T. Barr of Baton Rouge, Louisiana reports: "The corn was harvested on all plots. The stalks were chopped and rows reversed on plots. The plots on the 4 per cent slope show an advantage for the deep plowing after four years; but on the flat plots the regular plowing gave superior yields. In each case the plots with soybeans and winter cover crop gave much higher yields.

Corn alone Subsoiled 10/22/40	Corn alone plowed only	Corn and soybeans subsoiled 10/22/40 Winter cover crop '40, '41, '42, '43	Corn and soybeans plowed Winter cover crop '40, '41, '42, '43
Sloping plots <u>1/</u>			
18.13 Av.	12.02 Av.	32.07 Av.	22.58 Av.
Flat plots <u>1/</u>			
25.18 Av.	32.56 Av.	37.82 Av.	42.16 Av.

"1/ Yield in bushels of ear corn per acre."

John Lamb, Jr. of Ithaca, New York reports: "Potato harvest at the Arnot.-Killing frost at the Arnot held off until October 15. This made potato digging very late and resulted in some cold hands for the pickup crew; but it was worth it. Observations made in late September, when frost killed crops at the lower elevations, showed our yield to be only about 200 bushels per acre. The extra week's grace resulted in a 50-bushel per acre increase. Contour cultivation gave an average increase of 17 bushels, from 239 to 256 bushels per acre. One wet plot gave a decrease of 4 bushels, while the greatest increase was 55 bushels per acre. Potatoes after clover made a yield of 17 bushels more per acre than potatoes after potatoes.



"The mulch potato experiment did not come up to expectations this year. Severe wire worm and grub damage, and extremely large growth cracks resulted in a yield of few marketable potatoes on the mulched area. The total yield was also less than the unmulched area. However, the mulched potatoes were much larger in size. The location chosen for the experiment this year was a flat hilltop of Volusia. Apparently, poor drainage was the principal contributing factor to the low quality.

"Method of preparing seed-bed for corn, Marcellus:

"Results of preliminary study of the effect of different methods of seed-bed preparation

Method	Fertilization	Grain yield <sup>1/</sup>	Total oven dry matter	Stand	Height 7/10/44	Height 8/7/44
		Bu/A	Lb/A	Stalk/A	Inches	Inches
Turn plowed.....	High rate <sup>2/</sup>	57.0	7,106	12,644	29.3	84.4
Turn plowed.....	Low rate <sup>3/</sup>	54.9	6,090	12,240	30.2	86.8
Subsurface plowed.	High rate	59.1	7,485	12,503	29.4	91.2
Subsurface plowed.	Low rate	40.8	4,660	10,728	30.0	77.6
Disked only.....	High rate	43.5	5,237	10,930	30.1	76.8
Disked only.....	Low rate	28.8	3,408	8,873	27.2	72.0
Differences required to be significant - 5 pct. point		7.1	549			

"<sup>1/</sup> Adjusted to basis of 56-pound bushel of shelled corn at 12-1/2 per cent moisture.

"<sup>2/</sup> High rate - 1,000 pounds per acre of 10-10-10; 700 in bottom of furrow or disked in on disked plots, and 300 as row application with planter.

"<sup>3/</sup> Low rate - 300 pounds per acre of 5-10-5 as row application with planter."

Glenn M. Horner of Pullman, Washington reports: "Average yields for the stubble utilization plots (cropping system of winter wheat and summer fallow) are given below:

Initial tillage for fallow	Wheat straw returned Tons/Acre	Wheat yields Bu/Acre
Moldboard plowed	None (burned)	45.8
Moldboard plowed	One	42.9
Moldboard plowed	Two	42.0
Subsurface tilled	None (burned)	43.3
Subsurface tilled	One	42.0
Subsurface tilled	Two	36.7

"The wheat was seeded with deep-furrow drill so that the straw mulch on the subsurface tilled plots had a minimum effect on the stand of wheat obtained. The results show a yield depression where straw was returned as compared to burning the straw. This confirms results obtained from other experiments."

T. C. Peele of Clemson, South Carolina reports: "Tillage tests with corn on plots 1/15 acre in size are being conducted at Clemson in which the effects of maintaining plant residue from winter cover crops on the soil surface as a mulch during the growth of corn are compared with treatments in which the cover crops are either disked in or plowed under. The test plots are 1/15 acre in size and all cultural operations are performed with tractor equipment.

"When the disking and plowing methods were followed the usual clean cultivation procedures were used in cultivating the corn. Where mulch farming methods were practiced furrows were opened by means of reversed disk-hillers and corn was planted in the furrows. The area between the rows was plowed with a sweep type tillage implement designed to leave all of the plant litter on the surface of the ground. This procedure effectively controlled weed growth, but did not incorporate the plant residue.

"The corn yields from the three tillage treatments are shown in the following table. The yields were significantly higher where the mulch treatment was used than where the cover crop residue was plowed under, while the disked treatment which left some residue on the surface resulted in corn yields intermediate between the other treatments.

Influence of cover crops and tillage methods on corn yields  
in 1944

Cover crop	Tillage method	Number of plots	Average corn yield Bu./Acre
Vetch and rye	Mulch	5	24.3
	Disk	5	22.3
	Plow	5	19.3
Crimson clover	Mulch	3	22.3
	Disk	3	19.6
	Plow	3	16.6

Note: The above table is part of the report by T. C. Peele.

Edgar C. Joy of Brookings, South Dakota reports: "Corn yields from the tillage and residue plots at Brookings were as follows:

Wheat stubble left previous year	Plow	Oneway	Subsurface
Mowed.....	55.5	59.1	59.6
Six-inch stubble.....	55.9	54.8	58.9
Six - twelve inch stubble.....	58.7	60.0	62.7
Twelve-inch stubble...	54.7	56.6	56.7
All straw(combined)...	58.3	61.0	57.7

"On another set of plots testing the effect of grass on corn, yields were as follows:

"Two previous years crested wheat grass	60.9 Bu./A
Two previous years western wheat grass	63.9 Bu./A
Corn - wheat, check	56.0 Bu./A"

H. O. Hill of Temple, Texas reports: "For 1944 the yield of cotton and corn in two year rotations with hubam clover continued to be substantially greater than the yield from continuous cropping or a rotation of cotton, corn. This study is on Austin clay soil.

Rotation	1944*	1941-44
<u>Cotton yields - Lbs. lint per acre</u>		
Cotton, hubam for seed..	232	315
Cotton, hubam for hay...	218	273
Cotton, corn.....	174	213
Cotton continuous, check	161	165
<u>Corn yield - Bus. per acre</u>		
Corn continuous, check...	20.1	27.2
Corn, cotton.....	26.2	32.7
Corn, hubam for hay.....	35.4	36.6
Corn, hubam for seed....	33.4	37.4

"\*Prior to 1944 there seemed to be a direct relationship between the percentage of cotton dead from root rot in early September and the yield of cotton from treatments. This tendency overshadowed the soil building effect of hubam on the yield of subsequent cotton crops. In 1944 there was less than 5 per cent of the continuous cotton check dead on September 1 and there was very little cotton dead from root rot in any of the treatments. Hence, root rot was not a factor in the yield of cotton after hubam this year. Therefore, the 44 per cent increase in yield of cotton after hubam as compared with cotton after cotton can be attributed entirely to the soil building effect of the hubam clover in the rotation.

"Over the four years of this study the year assigned to the production of hubam for soil building has done double duty. In addition to the increased yield of cotton and corn after the clover year the hubam where harvested for seed has produced an average of 365 pounds per acre over the four year period and where it was harvested for hay the average production has been 1.54 pounds per acre.

"Band application of fertilizer on Houston and Austin soils have not increased crop yields sufficiently to pay for cost of the fertilizer. The reasons for this lack of plant response are not wholly clear. Since cotton makes its greatest demand for plant nutrients 90-150 days after planting and since July and August are the dry months of the year in this area it was thought that placement of fertilizer deeper in the soil might give increased crop yield. Deep placement of fertilizer would put the extra plant food elements in a zone where the moisture content of the soil does not go below the wilting point as it does in the surface soil.



"Four hundred pounds per acre of 4-12-4 fertilizer was applied 15"-13", 10"-12", and 3" deep below cotton seed at planting time. These fertilizer treatments were applied to Houston black clay and Austin clay. Each treatment on each soil was applied in duplicate. Average crop yields from each soil and each treatment are given in the following table:

"Effect of fertilizer placement on yield of cotton

Soil type	Fertilizer	Placement	Yield of cotton, lbs. lint per acre
Houston black clay	400 lbs. 4-12-4/A	15"-18" deep	448
" " "	400 lbs. 4-12-4/A	10"-12" deep	404
" " "	400 lbs. 4-12-4/A	3" deep	389
" " "	None	---	408
Austin clay	400 lbs. 4-12-4/A	15"-18" deep	232
" " "	400 lbs. 4-12-4/A	10"-12" deep	273
" " "	400 lbs. 4-12-4/A	3" deep	258
" " "	None	---	260

"It may be concluded from a study of these data that deep placement of fertilizer did not increase cotton yields in 1944. This study will be continued."

E. C. Richardson of Auburn, Alabama reports:

"Yields of corn following kudzu and sericea"

Ter- race in- ter- val no.	Yields following kudzu									Yields following sericea			
	225 lbs. of nitrate added	Residue devel- oped af- ter last culti.†	No nitrate added			Residue de- veloped after last culti- vation†	No nitrate added			225 lbs. of nitrate added			
	1944	1944	1943	1944	Avg.	1943	1944	Avg.	1943	1944	Avg.	1944	
	Bus.	Lbs.	Bus.	Bus.	Bus.	Lbs.	Lbs.	Lbs.	Bus.	Bus.	Bus.	Bus.	
1*	34.6	4,796	-	35.5	-	-	4360	-	-	48.4	-	46.0	
2**	35.8	4,796	20.3	29.2	24.7	8248	5232	6740	37.7	31.0	34.3	32.0	
3***	40.6	4,796	-	40.0	-	-	5450	-	-	39.3	-	40.0	

"† Green weight.

\* Rotation - 2 years kudzu or sericea followed by 2 years of corn.

\*\* Rotation - 2 years kudzu or sericea, corn continuous.

\*\*\* Rotation - 2 years kudzu or sericea followed by 4 years of corn.

"The check, or untreated area, produced 8 bushels per acre in 1943 and 2-1/2 bushels in 1944."

Oren R. Neal of New Brunswick, New Jersey reports: "The year 1944 marks the fourth season during which the potato yield study has been made. In 1941 yields were measured on a number of locations in a single field. In 1942 yields were measured on 7 farms, in 1943 on 12 farms, and during this year on 25 farms. A summary of the results is shown in the following table:

"Four year record of potato yields from eroded and uneroded areas"

Year	0 - 6 inches surface soil	Over 6 inches surface soil
	<u>Bus./Acre</u>	<u>Bus./Acre</u>
1941	329	370
1942	151	187
1943	164	228
1944	135	184
Average	194	242

"The average yields on all the areas included in this study during the past 4 years show an increase of 48 bushels per acre or 25 per cent for the uneroded areas as compared with eroded areas.

"As has been pointed out in previous reports, the individual comparisons of yield from eroded and uneroded areas are made in the same field. The yield from an eroded area on one farm is not compared with the yield from an uneroded area on another farm. Thus differences in fertilizer application, cultural practices and other variables do not influence the validity of the results. The range in yields from both eroded and uneroded areas on the different farms is considerable. However, at any one location there is a consistent trend toward higher production on the uneroded and less eroded areas.

"During the past 3 years the influence of increased nitrogen fertilization on the yield of potatoes has also been under study. The supplemental nitrogen was added, in all cases, in the form of sulphate of ammonia at the rate of 250 pounds per acre. This treatment, providing approximately 50 pounds of nitrogen per acre, was in addition to the regular potato fertilization which usually supplies about 100 pounds of nitrogen per acre. The areas receiving the supplemental nitrogen included both eroded and uneroded soil in each field.

"During 1942 the study was limited to a number of comparisons all in the same field. During subsequent years the treatment has been made and yields measured on 5 farms each year. The average yield from eroded and uneroded areas each with and without supplemental nitrogen treatment is shown in the following table:

"The influence of supplemental nitrogen fertilization on potato yields from eroded and uneroded soil"

Year	0 - 6 inches surface soil		Over 6 inches surface soil	
	250 lbs./acre Amm. Sulphate	No additional nitrogen	250 lbs./acre Amm. Sulphate	No additional nitrogen
	<u>Bus./A</u>	<u>Bus./A</u>	<u>Bus./A</u>	<u>Bus./A</u>
1942	292	220	296	298
1943	194	212	227	252
1944	105	149	147	183

"During the 1942 growing season the amount and distribution of rainfall was comparatively favorable. Under these conditions where soil moisture was sufficient at all times, the additional nitrogen brought about a large increase in yield on the eroded area. The treatment showed no significant effect on the uneroded soil. During the two following seasons when rainfall was deficient, there was a decrease in yield resulting from the nitrogen additions. This decrease appears to result from the fact that the plants receiving extra nitrogen make a more rapid growth early in the season but are not able to support the extensive foliage when prolonged dry periods occur. As a result these plants are damaged more than are the plants which have made a slower early growth."

C. A. Van Doren of Havana, Illinois reports: "In cooperation with A. L. Lang, Illinois Soil Experiment Fields, and M. E. Waggoner, Soil Conservation Operations, the following data were obtained on the field tests involving stubble mulch tillage in Mason County:

Farm	Decrease or increase	Regular plowing	Stubble Mulch
	Bu./Acre	Bu./Acre	Bu./Acre
Middlekamp farm - No treatment	- 9	21.8	12.2
Martin farm - No treatment	-14.2	26.4	12.2
Rush farm - No treatment	+ 1.8	12.6	14.4

"The Middlekamp and Martin farms are on sandy soils and the Rush farm is on a silt loam soil. In tests designed to determine the possibility of overcoming the previously observed deleterious effects of mulch culture, a small application of 150 pounds of 0-9-20 with 100 and 200 pound applications of ammonium sulphate was added on the sandy soils. These applications failed to overcome the bad effects of mulch culture on yields.

"On the Rush farm, silt loam soil, the complete fertilizer treatments gave excellent results. The data giving yields in bushels per acre are as follows:

"Treatment: 0-20-6 applied at 150 pounds per acre 1/

Item	0-20-6	0-20-6	0-20-6	0-20-6	Fall, 100	Fall, 200
		fall, 100 pounds sulphate	fall, 200 pounds sulphate	spring, 100 lbs. sulphate	pounds sulphate	pounds sulphate
Stubble mulch	15.5	20.5	28.3	20.2	4.3	5.8
Plowed.....	19.0	20.0	24.3	17.4	9.9	6.1

"1/ Fall and spring refer to time of application of ammonium sulphate."



G. M. Browning of Ames, Iowa reports: "Preliminary tabulations of the results from the rotation plots show an average increase in yields of corn of 30 bushels in favor of first year corn following legumes in comparison with second year corn in the same rotation. There also was an 18 per cent reduction in stand on second year corn in comparison with first year corn. These differences are even larger than was found in 1943 when there was a decrease in second year corn of about 10 per cent in the stand and in the yield. Part of the decrease in yield is due to the decreased stand on the second year corn which may be explained by the larger amount of silting in and crusting over in the bottom of the lister furrow of the second year corn. This is in accordance with aggregate analysis data from samples taken regularly from Experiment I in which it was found that the initial beneficial effects of the red clover in a rotation of corn, oats, and clover had disappeared by midsummer of the first year. It is recognized that these studies have not been going long enough to properly evaluate the effect of different types of meadow in the rotation.

"In the rotation residue Experiment VI there was a 32.5 bushel increase in yield from the sweet clover in a rotation of corn, oats, sweet clover in comparison with a rotation of corn, oats. There was not a significant difference in the yield from the plots on which the corn stalks had been burned in comparison with leaving the residue on the land. It is expected that the burning will need to be carried on over a number of years before any large differences will be detected.

"The yields from the control plots for 1943 and 1944 are shown in the following table:

"The effect of cropping systems on the yield of corn from the control plots, Experiment I, Clarinda, Iowa, 1944

Cropping system	Yield - Bushels per acre	
	1944	1943
Continuous corn - 1932-44.....	19.1	24.0
Continuous corn - 1932-44 (corn, oats, clover, 1943-44).....	33.6	-
Corn, oats, clover - 1932-44.....	89.3	83.2
Alfalfa - 1932-44 (corn 1943-44)....	87.4	107.5
Bluegrass - 1932-42 (corn 1943-44)...	76.0	67.4

"It is to be seen that the yields on the continuous corn plots and on the plot which has been handled in a rotation of corn, oats, and clover are essentially the same in 1944 as in 1943. On the other hand, there is a marked decrease in yields on the plot which had previously been in alfalfa from 107.0 bushels in 1943 to 87.4 bushels in 1944. Preliminary aggregate analysis data taken from these plots would indicate that the beneficial effects of alfalfa on soil structure was maintained during the 1943 cropping season but that there has been a rather rapid decrease in aggregation during 1944. On the other hand, the aggregation on the plot which previously was in blue grass has been maintained up to midsummer of 1944, the last date when aggregate analysis data are available.

"Interesting differences are developing in soil and water losses from these different plots. The data has not been summarized in detail, but indications are that soil losses from corn which previously was in alfalfa will be from two to three times as much as from the plots which previously were in blue grass and about the same as corn grown in a rotation of corn, oats, and clover."

### Hillculture Section

C. S. Britt of Beltsville, Maryland reports: "Ridged rows gave better corn yields in 1944 than were obtained under comparable conditions from either of two other contour practices.

### "Cultural Practices Compared

- "(1) Corn planted on ridged rows; two cultivations with a one-horse middle-buster run once to the row each cultivation.
- "(2) Corn planted flat; one cultivation with a one-horse 5-tooth cultivator run twice to the row; one cultivation with middlebuster run once to the row.
- "(3) Corn planted flat; two cultivations with a one-horse 5-tooth cultivator run twice to the row each cultivation

### "Harvested corn yield - bushels grain per acre

Replication	Cultural practice		
	1	2	3
1	63.4	62.6	50.4
2	61.9	51.1	51.8
3	62.6	37.0	39.0
Average	62.6	50.2	47.1

"The corn planted on ridged rows resulted in better stands because the seedlings were resistant to pulling by crows. Randomized samples at harvest time also indicated that yield per stalk was highest in plots planted on the ridge."

J. C. Moore of Auburn, Alabama reports: "For several years studies have been in progress at Auburn, Alabama with superior thornless selections of the honey locust. Two selections, Calhoun and Millwood have been studied since the spring of 1938. Some have been clean cultivated and some grown with Lespedeza sericea as a ground cover. The Lespedeza sericea has been cut semi-annually and the hay collected about the trees for mulch.

"Only one of the selections shows much promise at the present time. There is not any notable difference in the size of the plants but yields have been consistently greater on the Millwood selection.

"The following table will show the average diameter (6 inches above the ground) and the yield of the 7-year old trees:

<u>Variety</u>	<u>Average diameter</u>	<u>Average yield</u>
Calhoun	6.1	37
Millwood	6.8	146

"The 7-year old trees of the Millwood variety produced in 1944 an average of 146 pounds of pods per tree (dry weight basis) which at 48 trees per acre would be equivalent to 7,008 pounds of pods. The highest yielding tree for this variety produced 200 pounds of pods which at 48 trees per acre would be equivalent to 9,600 pounds of pods. This 9,600 pounds of pods would have a feed value equivalent to 320 bushels of oats or 171 bushels of corn per acre.

"After considering that the honey locust is consistently an alternate bearer the plant should still hold a permanent place on the farms in the Southeast."

Maurice Donnelly of Riverside, California reports: "Conservation practices in the lima-bean belt are spreading. The use of pick-up threshing machines on what might be called the level lands has increased greatly in the last few years. In the operation of many of these pick-up machines, the lima-bean straw is spread on the ground and left there. It is estimated that on 60 per cent of the level acreage where lima-bean straw was formerly sold off the land, the straw is now spread and left on the land. I believe this figure of 60 per cent is high, but certainly there is no doubt that there has been a real shift in this direction. Another conservation practice on the increase is subsoiling of gently rolling lands as exactly on the contour as possible, rather than the somewhat easier method of subsoiling parallel to field boundaries. Still a third practice on the increase is the two-year bean-grain rotation."



# DRAINAGE AND WATER CONTROL DIVISION

## Hydrologic Land-Use Studies

A paper on the subject of The Relative Effect of Raindrops and Overland Flow in Producing Soil Erosion was prepared by W. D. Ellison during the period, which was submitted for approval for publication in Soil Conservation. Mr. Ellison together with C. S. Slater prepared an article entitled: "Exploratory Studies of Factors that Affect Surface Soil and Infiltration", and was forwarded through the regular channels for consideration for publication in Agricultural Engineering.

North Appalachian Experimental Watershed at Coshocton, Ohio - L. L. Harrold reports: "Rain fell on only 4 days in October. The total for the month was 1.66 inches. The rain of October 3 which totaled 1.19 inches was the only one to cause runoff. With the harvesting of corn on the watersheds and mulch plots, samples were taken of the soil for the purpose of determining the physical properties and distribution of plant residues. These data are summarized in the following table:

Physical properties of soils and distribution of plant residues at end of growing season on corn plots: plowed, and disked, 1944 (average of six plots)

Tillage	Depth range	Percent of volume				Volume weight	Plant residues for the depth range
		Solids	Water	Air	Total pore space		
	Inches						Pounds per acre
Plowed	0-2	40.0	14.7	45.3	60.0	1.04	873
Disked	0-2	36.1	17.6	46.3	63.9	.94	4,940
Plowed	3-6	46.6	13.0	40.4	53.4	1.21	1,440
Disked	3-6	55.2	18.5	26.3	44.8	1.43	420

The values in this table support the observations of large differences in runoff and soil moisture on the plowed and disked watersheds reported in the previous months. The fact that the plant residues in the surface soil of the disked plots were six times greater than that of the plowed area is the reason that the disked areas were able to absorb so much of the rain that fell at high rates. It should be noted that the sum of residues in the combined 0-2-inch and 3-6-inch depths was larger in the disked than in the plowed areas. Although these values do not represent the entire amount of residue in the plow layer, it is reasonable to assume that the total plant residues remaining on the area at the end of the growing season are higher on the disked areas. It should also be noted that the pore space in the 3-6-inch depth for the disked areas was less than that for the plowed areas. The effect of the lack of pore space in this section of the profile is yet to be determined.

"Considerable time was spent on soil-moisture studies. Calibration curves for the Slater plugs and for the electric resistance gypsum blocks in soil samples were completed for watershed 109. The data obtained to date at watershed 109 were plotted, using the Slater plugs, gypsum block, and the soil-auger methods and all three methods showed reasonably good agreement. Calibration curves of additional samples for other areas at this station are in the process of development.

"A group of 50 farmers, including the Board of District Supervisors and County Agent from Medina County visited the project on October 6."

Central Great Plains Experiment 1 Watershed at Hastings, Nebr. - I. W. Bauer reports: "A total of .84 inch of rain was recorded at the Meteorological Station. There was a small amount of runoff on the 5th at some of the stations, but no runoff for the rest of the month.

"Corn samples were taken during the latter part of the month. Yields per acre from the 40-rod row samples were as follows:

Straight Row			Contoured			Subtitled			Strip Cropped		
Grain		Stover	Grain		Stover	Grain		Stover	Grain		Stover
3H	28.7	2317	5H	42.1	3425	21H	19.1	2673	10H	35.6	3524
16H	29.0	2633	13H	48.0	4990	22H	27.7	2554	11H	38.1	3564
									14H	40.1	4831
Ave.	28.8	2475	Ave.	45.0	4208	Ave.	23.4	2614	Ave.	37.9	3973

The fall wheat is suffering a little from lack of moisture as the ground is quite dry near the surface."

Hydrologic Studies - LaFayette, Indiana - R. B. Hickok reports: "Wheat was seeded on the watersheds between October 7 and 12. Disking and seeding followed the corn rows which were contoured on the conservation-treated watersheds. The following table gives comparison of yields for the conservation- and prevailing-practice watersheds as indicated by sampling:

1944 Corn Yield on Experimental Watersheds

Watershed No.	Practice	Acre Yield	Plants per foot	Ears per foot	Ear Weight
2	Improved	68.4	.93	.79	7.8 oz.
11	Improved	72.1	.93	.79	8.2 oz.
Average		70.3	.93	.79	8.0 oz.
4	Prevailing	50.9	.71		
12	Prevailing	44.3	.71	.57	7.0 oz.
Average		47.6	.71		

Significant difference at 5% level; .94 bu. Significant difference at 1% level; 1.27 bu.

"The average increase of 22.7 bushels per acre for the conservation treatment over the prevailing was probably largely attributable to the heavier fertilization of the corn, since there was no runoff from any of the watersheds between plowing and harvesting of the corn due to abnormally light rainfall and consequently there was no conservation of moisture by the contour tillage. There was possibly some residual effect of heavier fertilization of wheat two years before. Corn on the conservation watersheds had approximately 6 tons of manure and 800 pounds of 8-8-8 fertilizer plowed under in addition to 125 pounds of -.14-7, sowed with the planting on both the conservation- and prevailing-treatment watersheds.

#### Chemical Analysis of Corn Grain

Watershed	Practice	Percent Protein	Percent $P_2O_5$	Percent $K_2O$
2	Improved	9.8	.76	.40
4	Prevailing	9.5	.63	.44
11	Improved	9.7	.60	.45
12	Prevailing	9.8	.70	.39

"Chemical analysis of corn grain showed no significant difference in 1944.

"Stalks analysis of corn is being made, but has not been completed to date.

"The following table shows yields of corn for the 1944 plots (Expt. #1). The entire plots were harvested and weighed, except border rows at each side and 15 feet off the ends, resulting in net harvest of approximately 1/4 acre per plot:

#### 1944 Corn Yield on Residue Mulch Plots

Plot No.	Tillage Practice	Acres Yield	Plants per foot	Ears per foot	Ear Weight
1	Plow	58.5	.7	.52	8.3 oz.
6	Plow	54.5	.7	.49	7.8 oz.
Average		56.4	.7	.50	8.0 oz.
2	Subtill	56.9	.7	.67	7.5 oz.
4	Subtill	59.8	.7	.68	8.0 oz.
Average		58.3	.7	.67	7.8 oz.
3	Disk	53.7	.8	.75	6.6 oz.
5	Disk	53.5	.6	.62	7.7 oz.
Average		53.6	.7	.69	7.2 oz.

"Old abandoned timothy and legume meadow was plowed under and subtilled on the first two pairs of plots. The second pair was subtilled once the previous fall and again in the spring. The meadow was disked in the fall on the third pair and rye sown. The rye was disked for green manure in the spring.



"All plots received 200 pounds 20 percent ammonium sulphate broadcast in early spring, approximately 800 pounds of 8-8-8 deep placement in bands before preparation of the seed bed (special experimental applicator) and 150 pounds 5-9-6 sowed with the planter. Tillage experimental plots nearby, for which yield data are not yet available, received only the ordinary fertilization at planting and much greater differences were noted between growth and apparent yield for plots with varied tillage treatment similar to those applied on plots for which yields are tabulated above. From this and other observations, it appears that methods of residue management may have greater effect on yields where fertility is limited."

Hydrologic Studies - East Lansing, Michigan - Robert G. White reports: "The 1944 drought in central Michigan continued through the month of October, the total rainfall amounting to slightly over a half inch. The average rainfall for the month, based on the 40-year record of the U. S. Weather Bureau, is 2.39 inches.

"Mr. C. J. Borum and Mr. R. V. Norman, statisticians for the Lansing office of the Bureau of Agricultural Economics, visited the project on October 18. In past years Messrs. Borum and Norman have been using frost depth and penetration data collected at the project to assist them in predicting the probable date at which farmers could start field work. It was the first opportunity Messrs. Borum and Norman had had to visit the project and they expressed considerable interest in the work.

"Robert G. White spent three days, October 23-25, inclusive, in Wisconsin with the Wisconsin Valley Improvement Company. Mr. M. W. Kyler, General Manager of the Wisconsin Valley Improvement Company, had just completed installing a series of thermocouples and gypsum blocks on the upper reaches of the Wisconsin River in order that they might have better information as to the soil moisture and temperature at the time of the spring snow melt. These installations were carefully checked and, in general, were found to be satisfactory. It was found, however, that due to improper use of solder on the thermocouple circuits, that temperatures being recorded were about three degrees too high. Fortunately, all junctions improperly soldered were above ground and it was a relatively easy matter to make the necessary corrections."

Hydrologic Studies - Ithaca, New York - B-2 - Dr. John Lamb, Jr., reports: "Precipitation and temperatures were below normal for the period. The average rainfall for all watersheds was 2.64 inches, or 75 percent of the station 9-year average of 3.51 inches. Freezing temperatures started on the 15th and continued intermittently with a low of 25 degrees on the 28th.

"While the soil has been moist, no runoff occurred during this period. No construction or tabulations."

Hydrologic Studies - Cherokee, Oklahoma - B-2 - H. A. Daniel reports: "Precipitation was 3.6 inches and occurred in four storms. On September 27 and 28, a rain of 2.47 inches occurred which caused considerable runoff. This storm was followed by another of 2.26 inches on October 2. It caused a large amount of runoff from all experimental areas. Most of

the plots had been freshly cultivated and there was considerable silting along the channels of the terraces. There was also quite heavy silting in some of the water channels. This condition should afford an opportunity to determine the degree of silting that buffalo and other grasses and legumes will withstand. At the present time alfalfa and weeping lovegrass seem to have withstood this condition as well or better than any of the other plants being tested."

Microbiological Studies - Lincoln, Nebraska - F. L. Duley reports:

"Most of the time has been spent in assembling and writing reports of results obtained. One article, 'Influence of Microorganisms and Some Organic Substances on Soil Structure,' has been submitted to Soil Science. Another on 'Some Factors Affecting the Percolation of Water Through a Layer of Loessial Soil' is in the hands of the reading committee, and a third on 'Soil Temperature Variations under Residues' is being prepared."

Runoff Studies

D. B. Krimgold reports that the comments thus far received on the Claypan Prairie and Western High Plains reports indicated that simplified sets of instructions will have to be prepared in addition to the reports. The general opinion seems to be that the cost of the smaller ponds will not justify even the simple computations outlined in the reports. Second printings have been made of SCS-TP-51, "Devices for Measuring Rates and Amounts of Runoff," and of SCS-TP-53, "Preliminary Report on Watershed Studies near Waco and Garland, Texas," to meet additional demands for these publications. A simplified method of compiling total runoff which will greatly reduce the work involved has been developed by Mr. Krimgold and is being tested out. This method differs from other similar methods in that it utilizes Simpson's rule of determining areas under irregular curves. This mathematical device made it possible to develop a simple procedure which gives results of required accuracy while requiring a greatly reduced amount of work.

Runoff Studies at Albuquerque and Santa Fe, N. M.; and Safford, Ariz. - J. H. Dorroh, Jr., reports the completion of the "Hydrologic Section" of the "Engineering Handbook" for Region 6. This "Hydrologic Section" has been prepared at the request of the Regional Engineering Division.

Runoff Studies at Bentonville, Ark., Muskogee, Okla., and Garland, Texas - V. D. Young reports all of the precipitation for the month at Bentonville occurred in the first seven days of October. The mean of the gages for the period was 4.00 inches which was .38 inch more than the Weather Bureau normal for Bentonville.

No runoff occurred on the 14-acre pasture area or from the 24-acre wooded area. The peak rates on the remaining four watersheds in cfs per acre were as follows:



Watershed	Cover	Peak rates in cfs per acre			
		Oct. 2	Oct. 3	Oct. 4	Oct. 7
10 acres W-I (Sears)	Grain sorghum 3' high	.778	1.985	.214	.906
9 " W-II (Henderson)	Pasture no grazed during summer	.002	.033	.012	None
19.4 W-V (Mayfield)	Fall pasture good cover	.050	.435	.018	.045
11 W-VI (Rife) terraced	Fall pasture good cover	None	.359	.006	None

Runoff Studies at Danville and Blacksburg, Va. - T. W. Edminster reports four rains with a total of 2.59 inches for October on the two watersheds at Blacksburg.

No runoff was recorded on the 5-acre watershed. The 1.94 inches of rain on October 20 produced 0.0079 inch of runoff at a maximum rate of only 0.0757 second-feet on the 19-acre watershed. He states, "This extremely low runoff from watersheds that, prior to the initiation of strip cropping, gave high rates of runoff from nearly all rains, is very significant."

#### Hydraulic Studies

Hydraulic Studies at Minneapolis, Minnesota - F. W. Blaisdell reports: "The full-scale model of the McCredie, Missouri drop inlet culvert crest and the dam fill were completed early in September. Tests on this model were completed on September 22. The data were then analyzed and rating tables were prepared. The results of these tests are covered in a report entitled 'Model Calibration of Drop Inlet Culvert Located at McCredie, Missouri.' This report was submitted under date of November 1. No unanticipated results were obtained from the full-scale tests. These tests were made to extend the rating curve to low heads and the rating obtained ties in nicely with the rating obtained from the 1/4-scale model.

"Mr. Donnelly and Mr. Blaisdell spent October 26 through 28 in the vicinity of Red Wing, Minnesota, inspecting soil-conservation structures that have been in use for several years. In this inspection they accompanied the District and Regional Office personnel. Needless to say, much information was obtained which will prove valuable in the laboratory solution of problems involved in gully control.

"On October 19, Professor L. Donald Doty of Cornell University visited the Laboratory and showed considerable interest in the work."

Hydraulic Studies at Logan, Utah - C. W. Lauritzen reports: "Permeability and shrinkage measurements were continued. Additional tests were made with the canal model employing a lining consisting of a sandy loam soil to which was added 2 percent of bentonite by weight.

"Dr. O. W. Israelsen made a preliminary investigation of Washington Fields in the vicinity of St. George, Utah, in response to a request from the Office of Operations for assistance from Research in the solution of a drainage problem. The establishment of a cooperative test as a feature of this assistance has been proposed and tentatively agreed upon."



Hydraulic Studies at McCredie, Missouri - B-2 - D. D. Smith reports:

"The bluegrass sod channels of the cross-section experiment were tested during the period October 23 to November 2. Channels were tested for 6 flows varying from 5 to 60 cubic feet per second. There were 3 cross sections (2-foot bottom with 2 on 1 side slope, 6-foot bottom with 4 on 1 side slope, and V-shape with 6 on 1 side slope) on bed slopes of 1, 4, and 8 percent. These channels were prepared and sodded during 1941. Preparation of the soil and sodding was as nearly identical as possible on the different sections. However, the sod in the V-shaped channel had developed into an exceptionally good cover of bluegrass, while that in the trapezoidal channels was very thin, particularly on the channel bottom."

Hydraulic Studies at Prosser, Washington - Stephen J. Mech reports: "The analysis of the soil moisture gained in the top four feet at the upper and lower half of the plots has uncovered some very interesting information for the alfalfa plots. The following table shows the difference between the gain in percent at the upper half of the plot and that gained at the lower half.

"The values are the percent moisture gained at the top minus that gained at the bottom. Thus a plus value means that the gain at the top was the greater while a negative value represents a greater gain at the lower half.

Differences between the moisture gained  
(Gain at top minus gain at bottom)

Plot No.	May 17	June 6	June 30	July 20	Total
<u>Contour Plots (2% Grade)</u>					
B-1	1.4	1.7	-3.1	-1.2	-1.2
-2	5.6	-2.7	-1.0	1.3	3.2
-3	2.3	0.2	-1.1	1.2	2.6
-4	0.5	-.5	-1.2	1.0	-0.2
-5	1.4	1.4	-1.7	1.7	2.8
-6	3.2	1.4	-1.2	2.4	5.8
-7	-1.5	0.9	-0.5	0.6	-0.5
-8	0.9	.1	-3.0	1.7	-.3
-9	1.0	1.6	-3.0	3.8	3.4
Total	14.8	4.1	-15.8	12.5	15.6

Differences between the moisture gained (Cont'd)  
(Gain at top minus gain at bottom)

Plot No.	May 17	June 6	June 30	July 20	Total
<u>Downhill Plots (7% Grade)</u>					
B-10	1.5	-2.9	-1.2	2.7	0.1
-11	2.1	0.2	0.7	0.9	3.9
-12	3.2	-1.1	1.1	.6	3.8
-13	2.8	-2.2	1.3	2.5	4.4
-14	1.3	0.9	-0.8	2.5	3.9
-15	0.8	-.5	-1.8	2.8	1.3
-16	1.9	.4	0.5	2.4	5.2
-17	1.4	-.6	1.9	4.8	7.5
-18	<u>-4.4</u>	<u>.3</u>	<u>-3.3</u>	<u>3.5</u>	<u>-3.9</u>
Total	10.6	-5.5	-1.6	22.7	26.2

Note: Alfalfa seeded in wheat and ditched March 21.  
Wheat cut for hay and raked off plot June 14.  
First ditching after wheat came was on July 14.  
June 30 irrigation furthest away from ditching and that on  
July 14 was immediately after reditching."

Hydraulic Studies at Corvallis, Oregon - Albert W. Marsh reports:  
"Soil samples which had been brought in from the field were assigned numbers and prepared for laboratory analysis. Profile samples were subject to mechanical analysis. Very little distinction in textural composition occurred between the bad and the good area except that the bad spots always have a layer of clay accumulated somewhere in the B horizon not found in the good spots. Silt ran rather high, 50 percent or over in most samples.

"Laboratory percolation studies were initiated on disturbed profile samples using constant head permeameters in quadruplicate. Initial runs are showing good agreement between replications and marked differences between horizons."

Hydraulic Studies at the California Institute of Technology, Pasadena, California - Vito A. Vanoni reports: "A request was received from the Regional Engineer, Region 7, for comments on the proposed design of the Milagra Valley Dam Spillway. Recommendations on certain changes were made for the design of the stilling basin at the end of the spillway. The inlet to the spillway was rather unconventional in design and it was not possible to make safe recommendations without some laboratory work. Therefore, a brief model test was made of the inlet and recommendations made on the basis of this study. The inlet was a trapezoidal section with side slopes of 1-1/2 to 1 and a bottom width of 20 feet. The chute section was a trapezoid with the same side slopes and a bottom width of 8 feet. The problem was to contract the flow so that it entered the chute without disturbance and without backing the water up into the reservoir. This was accomplished by dropping the inlet section 3 feet into a trapezoidal section 17 feet long

of the same cross section as the inlet. The chute section was then joined to this section by merely rounding the corners at the inlet. The design flow for this structure is 1,000 cubic feet per second.

"The American Society of Civil Engineers has awarded the 1944 Collingswood Prize for Juniors to Walter L. Moore for his paper, entitled, 'An Experimental Determination of the Energy Loss in a Hydraulic Structure of the Free Overfall Type,' which appeared in Transactions, ASCE, Vol. 108, 1943, pp. 1343 to 1392. This paper covers a study made by Mr. Moore during the fiscal year 1939-40 while he was employed by this project. The paper gives valuable data on energy loss at a fall which can be used to design hydraulic structures of various kinds. The Collingswood Prize carries with it an award of \$50.00"

### Sedimentation Studies

C. B. Brown reports: "Computations were completed on sedimentation in Alamogordo Reservoir on the Pecos River, New Mexico. This reservoir was completed in 1937 by the Bureau of Reclamation to serve as the principal water storage reservoir for irrigation of the Pecos River Valley. A sedimentation survey was made in 1940 under supervision of the Soil Conservation Service in connection with USDA participation in the Pecos River Joint Investigation, conducted by the National Resources Planning Board. The ranges established in this survey were used by the Albuquerque Office of the Corps of Engineers, U. S. Army, to make a resurvey in April 1944. Sediment measurements made on these ranges were used by the Engineer Office to plot contours on top of the sediment from which the present capacity was determined. The same data were supplied to this office where a computation was made of the total sediment volume by the range method.

"The volume of sediment below spillway elevation determined by SCS computations was 24,412 acre-feet. The measured deposits above spillway level are 597 acre-feet. Subtracting the present capacity determined by the Engineer Office from the original capacity figure determined by the Bureau of Reclamation from an original map of the reservoir, the sediment volume would be 24,599 acre-feet. This difference is well within the limits of survey error. The original capacity determined by the Soil Conservation Service in 1940 was 154,751 acre-feet or approximately 2,000 acre-feet less than the original capacity determined by the Bureau of Reclamation. The total capacity loss shown by the 1944 survey is 15.78 percent or at a rate of 2.29 percent per year. There has been exceptionally heavy runoff during 3 years out of 7. Although the rate of sedimentation may be above the long-time mean, the indicated useful life of this major development is less than 50 years. The contributing drainage area of 2,400,000 acres is shown to be in serious need of conservation by the average annual sediment production of 2.36 tons per acre.

"At the request of the Office of Chief of Engineers, U. S. Army, an analysis was made of rates of sediment production in the Illinois River Drainage Basin. On the basis of 20 records of suspended-load measurements and reservoir-sedimentation surveys in the Illinois River Basin and adjacent watersheds having the same soil, slope, climate, and land-use conditions, envelop curves were plotted on logarithmic paper for the rate of sediment production, in tons per square mile, against drainage area in square miles. Although a



considerable spread of values is found, as should be expected, the evaluation of the data provides a basis for reasonable estimation of rates that might be assumed in the design of storage and conservation structures until further field studies can be made. The curves may be reproduced on logarithmic paper from the data given in the following table. The lack of data in smaller watershed areas is noticeable and unfortunate.

Sediment production rates in Illinois River Drainage Basin  
drainage area (square miles)

Sediment production (T./sq. mile)	0.5	1.0	10	100	1,000	10,000
Maximum	—	—	—	1,900	620	200
Minimum	750	625	350	168	87	45
Recommended design value	—	5,600	2,400	1,000	430	180

"An article was prepared for Soil Conservation entitled 'Downstream Interests in Soil Conservation.' This will be printed in the December issue of the magazine. Another short article entitled 'Mud in the Meramec' was prepared and accepted for publication in The Land magazine.

"Work was continued on the studies of sedimentation in the Chesapeake Bay region with relation to its effect on navigation and costs of dredging."

Sediment Studies of the California Institute of Technology,  
Pasadena, California - Vito A. Vanoni reports: "A first draft of a manuscript was completed by Dr. H. A. Einstein on the subject of bed-load transportation, in which a bed-load formula is derived, based entirely on the known laws of turbulent flow. The new formula enlarges on a formula presented by Dr. Einstein in an earlier article entitled, 'Formulas for the Transporation of Bed-Load,' Transactions, ASCE, Vol. 107, 1942, pp. 561-597.

"SCS-TP-55 by Hans Albert Einstein, entitled 'Bed-load Transportation in Mountain Creek,' which was prepared in 1942 at the Greenville Sediment Load Laboratory, is ready for distribution. The report shows how bed-load measurements in natural streams check with the findings of laboratory measurements. Furthermore, it shows how the results of studies can be used to determine, by rational methods, the amount of bed-load movement in natural streams. A rational method gives the engineer a tool with which he can predict quantitatively the effect of the different elements of the channel on its capacity to carry water and sediment. Of special interest in this paper are the results which show the large effect on the sediment-transporting capacity of a stream of the different types of bank covers. The results of laboratory bed-load studies have already been used to very good practical advantage in some actual stream-control and sedimentation problems in Southern California.

"Demonstration of density currents in the laboratory tank were given for several visitors. Experience has indicated that such demonstrations are very valuable in helping interested technicians in visualizing the mechanics of density flows and how they can be used practically. Very often requests have been received from people interested in applying density currents for additional demonstrations which illustrate particular applications. As a result of such a demonstration, a request for the loan of one of the motion pictures on this subject has been received for the Fish and Wildlife Service, Department of Interior, Seattle, Washington. That office is interested in density currents and reservoir stratification as they affect the propagation and growth of fish.

"The Arroyo Simi in the Simi Valley Conservation District was visited by representatives of the laboratory and one of the District office to discuss and plan observations of scour during the coming runoff season. After a detailed examination of the Arroyo, it was finally decided to locate three measuring cross sections in the Wash near Moorpark. The three sections are located respectively in a typical wide section of the stream, a typical narrow section, and a typical curve. All three sections are located within a reach of about a thousand feet in length within which the county engineer has a gaging section and an automatic stage recorder installed, which will give the runoff.

"The method used to measure the amount of scour is to dye sand in verticals of a stream cross section before any runoff occurs. After a flood, the sand bed is excavated down to the point where the dyed sand has not been removed, thus locating the maximum depth of scour. Plans are to locate these verticals about 10 to 15 feet apart at each of the three cross sections. The work of dyeing the sand has been started. The data on the depth of scour are very important in the design of revetments and other structures, the foundations of which are in the stream bed.

"As a companion study to the measurement of stream bed scour, a laboratory study is being carried on to investigate stream bank revetment design. Apparatus, equipment, and techniques for making this study are being developed."

### Drainage Studies

Purdue Muck Crops Farm, North Liberty, Indiana - R. E. Morris reports: "Practically all of October was spent in installing water-level observation wells in the drainage plots. Through October 31, 16 wells were installed and ditches were excavated for 9 more. In addition, the foundation for the implement shed was poured and we now await the delivery of the lumber. Except for the first week excellent weather has prevailed. On Oct 5 we recorded rainfall at the rate of 2 inches per hour for a period of 30 minutes.



Drainage Investigations at St. Paul, Minnesota - D. G. Miller reports: "The time of Mr. Wiberg and myself was very largely spent with the experimental specimens due for tests this year after having been installed at four locations in Minnesota and four locations in Wisconsin. This work is in connection with our durability studies of drain tile in peat.

"We now have completed testing all drain tile that we have had under observation and today have started testing the first of more than 700 concrete cylinders which had been installed for 19 and 20 years. Last week we photographed all these cylinders so that when the compression tests are completed, the story will be complete and, I believe, convincing.

"As soon as the current tests are completed and the results compiled, I will finish the 'Durability of Drain Tile in Peat' report. I thought I had this report just about complete a couple of months ago, but after we started digging up and testing the drain tile and cylinders that had been exposed around 20 years, it became evident that the report would have to be modified with respect to a number of conclusions. As the evidence accumulates, the advisability of using concrete drain tile in peat becomes more and more a matter of question. It almost begins to look as though 30 years is just about the life of even high type drain tile in peats even though the peats be of low acidity. I thought some weeks back that the story would be more favorable than this but it now begins to look otherwise. I am referring particularly to tile of the smaller diameters as now made. The story can be different for the tile of larger diameters with the thicker walls."

Drainage of Sugarcane Land, Baton Rouge, Louisiana - John T. Olsen, project supervisor for this project, has been transferred to Washington to become the Assistant Chief of the new Water Conservation Division, Operations. I. L. Saveson reported for duty October 2 to take over the duties of project supervisor. I. L. Saveson reports: "Hydraulic lines were extended on tractor for use with hydraulic cylinders on Killifer mole machine designed and installed by Mr. Olsen. Professor E. B. Doran and two freshman students aided in this work in order to give them some practice in pipe work.

"Mr. Olsen and I contacted Mr. Gibbens on Cinclare plantation to make arrangements to complete work consisting of removing high place in grader built ditch, extending mole work to block of 6 cuts east of upper gage, moleing three cuts and leaving three for check, and along with the mole work, cutting down the spoil bank on the lateral ditches.

"Mr. Bronier Thibaut, of Woodlawn Plantation, Napoleonville, Louisiana, was approached by Mr. Barr and Saveson, and we arranged for an experimental area of approximately 10 cuts. Mr. Barr is interested in this area since it is away from the Mississippi River and probably not affected by seepage from the river. Mr. Barr and I contacted Mr. L. C. Bourgeois, of Smithfield Plantation, and arranged for experimental area of approximately 15 cuts on the gravel road approximately 2,500 feet west of the sugar house. This is a promising area with a good outlet and is accessible by a gravel road.



"The Agricultural Engineering Department and Soil Conservation Service, represented by Mr. Olsen and Saveson, held a field demonstration for the four State Conservationists of this region the morning of October 23, 1944. The English mole machine, side arm equipped dragline, and ditch burners were demonstrated. (The side arm and special bucket for the dragline was received from England during the period.) The group showed considerable interest in all phases of the demonstration.

"The weather for October was mild and dry and 1.38 inches of rainfall was recorded."

The Everglades Project at Ft. Lauderdale, Florida - C. Kay Davis reports: "The engineering survey party is making cross sections of the South New River and State Road 25 Cross Canal between 6-Mile Bend and the east end of this canal. They will continue during the month of November to make cross sections of the Cypress Creek Canal and possibly Snake Creek Canal. It is also contemplated that some time during the month of November we will establish a level line across the Loxahatchee Slough Area.

"During the construction of State Road 25 many of the big boulders were rolled back into the canal and, of course, such obstructions will not be reflected in the cross sections. Concrete structures in the South New River Canal have restricted the quantity of water which can be conducted by this channel. Our cross sections will have a greater value in showing the necessity for correcting these conditions than as a basis for computing their capacity for drainage.

"I have delayed a report of the effect which the hurricane had in the Everglades pending the completion of the data which have been now compiled and submitted as a supplement to the September report by the Everglades Drainage District. Our principal study was made on the Palm Beach Canal. We cooperated with the U. S. Geological Survey in collecting the data. We did not have enough personnel to make a comprehensive study of all the canals during the storm period, so concentrated our work on the Palm Beach Canal.

"The damage to the crops in the Lake Region was considerable, particularly to the bean crop which was nearly ready for harvesting. The wind did not do much damage, but many of the cultivated fields were covered with water after the storm, and several days were required to bring the water table down. They are only now able to determine the effect which the high water table had on the potato crop. It is believed that many farmers will remember this storm and give their support to a more effective system of drainage and control of drainage. The supplemental report was not printed until a few days ago.

"Prior to the storm, during the week of October 14, there was not sufficient rainfall to make any difference in the water table in any particular area. Since the storm, however, I have requested Mr. Clayton to make a measurement of the water table in Section 4 (an enclosed area) and also in adjacent areas of free-water movement. We may have something to report on the difference in water table in an enclosed area and unenclosed area in our project report for the month of November.

"I am anxious to conclude the study of the value of determining the difference in water table in enclosed areas and in adjacent areas of free-water movement so that we can begin the study of pumping excess waters from uncultivated section into a reservoir section and get accurate measurements of the amount pumped into the reservoir section. This amount would be subtracted from the quantity which would ordinarily be pumped into the drainage canals during storm periods. All of the arterial canals were run full during the hurricane storm. Many farmers would have pumped into a reservoir section had their crop rotations been so planned. I believe that in addition to the use of a section as a reservoir during storm periods that the increased yield the next year on this reservoir section will make this practice very popular after it has been given sufficient trial to record the advantages and disadvantages."

## IRRIGATION DIVISION

### Water Requirements for Irrigation

#### Evapo-Transpiration and Seepage Losses

Santa Ana Canyon water supply study, California - Harry F. Blancy reports that representatives of the Division of Irrigation and the U. S. Geological Survey reviewed results of cooperative field investigations to date and prepared an outline for the 1944 annual progress report. It was agreed that additional analyses of well records, ground-water fluctuations, and miscellaneous surface-water measurements were needed before the report could be completed, and that Dean C. Muckel and Willis C. Barrett of the Division of Irrigation and Harold Troxell, Hydraulic Engineer of the U. S. Geological Survey, would undertake these studies.

Mr. Muckel reports that work on the Santa Ana River investigation during the month of October consisted mainly of the collection and analyzation of data in preparation of making a preliminary estimate of the water losses in Santa Ana Canyon. A consumptive use of water station near Prado Dam was continued and frequent checks were made on a cooperative evaporation station. Studies made by Messrs. Muckel and Barrett indicate that unmeasured inflow consisting of seepage under Prado Dam and underflow along numerous tributary canyons is apparently much greater than was thought at first.

A. A. Young reports continuance of evaporation measurements at Beaumont and San Jacinto, Calif. These stations are only 10 miles apart, but are separated by a range of hills and there is a difference of 1,000 feet in elevation between them. Beaumont station is in San Geronio Pass through which desert winds flow. Because of these conditions evaporation is often the greater for the higher elevation.

D. W. Bloodgood reports that the regional office of the Weather Bureau at Fort Worth, Texas, has sent a representative to Lake Wichita to install equipment for the cooperative evaporation station. Mr. Bloodgood has submitted the routine evaporation and other meteorological data for Buchanan and Marshall dam stations during September.

Carl Rohwer reports that, during his recent Oregon detail, some attention was given to the study of the seepage problem on a small irrigation project in northern Oregon. Seepage measurements by the Soil Conservation Service engineers indicate a 50 percent loss in about 7 miles of canal. The formations throughout most of the area traversed by the canal do not appear to be highly pervious, although there are local areas where considerable seepage is visible. The problem is to determine where the seepage occurs and how to prevent it by economical means.

Dean W. Bloodgood visited West Texas in company with the Texas Board of Water Engineers, a representative of the U. S. Geological Survey, and a representative of the Texas State Attorney General's office. At Fort Stockton a conference was held with Water District, State, and Federal (including Army Engineers) officials regarding plans for the development of Pecos River Basin and the status of the Pecos River compact. The Red Bluff dam was visited and examined, the matter of interest being the sink holes behind the dam and in the spillway channel. The reservoir contained only about one-third of its capacity.



Mr. Bloodgood also visited the Lower Rio Grande area where two extensive Soil Conservation districts have been formed (Brownsville and Willacy-Hidalgo). The Division of Irrigation will cooperate in solving some of the problems of these districts by furnishing cans and weighing and drying soil samples for soil-moisture determinations, in order to determine moisture penetration and efficiency of irrigation. The Division will also furnish steel cylinders by which undisturbed cores may be obtained for soil testing and to determine rate of permeability of moisture into surface and tight-clay sub-soils. A mimeograph copy of a report by W. R. Rockwell, formerly of the Division of Irrigation, on Movement of Moisture in Soils, is being prepared for release to SCS and other authorities.

Dean C. Muckel reports that in working with evaporation records for the Santa Ana investigation, it was found that the present station at Prado Dam has about 25 percent more evaporation than that at Fullerton or the old Prado Dam. Wind movement at the Prado Dam station is about double that of either of the other two stations, probably owing to its extremely open exposure. In order to obtain more reliable records within the canyon it is planned to install one or two more pans and operate them at least during the summer periods.

#### Hydraulics of Irrigation

Design and Invention - R. L. Parshall reports that a model sand trap, scale ratio 1-to 4 has been constructed and put in operation at the hydraulic laboratory. This model is of the riffle-deflector type where the deflectors are of curved metal vanes so spaced and aligned as to cause the bed load in the channel to move laterally, in a restricted zone, just downstream behind the line of riffles. Former experiments at the Bellvue laboratory on this kind of sand trap indicated the possibility of developing it into an efficient and practical scheme of ridding irrigation canals and ditches of the deposit carried in such channels. Following the Bellvue studies, an experimental structure of this type of trap was built in the Mannamaker Ditch, diverting from Clear Creek, near Golden, Colorado. Tests on this installation, under the most favorable conditions, showed a rate of trapped sand in the amount of about 15 pounds per second - the sand being 40 mesh or less in size. Unfortunately the site of this trap was immediately downstream from the city dump, and the structure was so handicapped because of the large quantity of trash of all kinds lodged in the riffles, that it was finally abandoned. When operating normally, the trap had proved highly efficient.

Since observing critically the current action of flow through the model, now under study, certain alterations and modifications appear to indicate the possibility of further improvement to this particular design of sand trap.

Carl Rehner reports that measurements of loss of head through a 6-inch valve at  $1/4$ ,  $1/2$ ,  $3/4$  and full opening were completed at the Bellvue laboratory. The results of the measurements have been computed and plotted. They are similar to those obtained for the 12- and 8-inch valves previously tested. The present plan is to test a 4-inch valve before closing the laboratory this fall.

Pumping for Irrigation - A report covering the pumping problems of the High Plains of Texas was prepared by Carl Rohwer and submitted to the Berkeley office for approval. This report contains suggestions regarding well development and the design and operation of pumping plants so as to get the most efficient service from the equipment. Information regarding the ground-water supply is also included.

Control of Silting - Silt determinations were made by D. W. Bloodgood for all 19 stations in Texas, and the results were transmitted to co-operating agencies. The water samples contained little silt. A sample from an exposed deposit near the upper end of Red Bluff reservoir was received for testing and chemical analysis. Lake Corpus Christi dam station on Neucos River and Goliad station on San Antonio River were visited and new features of the work were discussed with the silt-sample collectors.

#### Sources and Storage of Irrigation Water

Snow Surveys and Water-Supply Forecasts - J. C. Marr reports that he, A. T. Mitchelson, and Wayne D. Criddle left Boise on October 9 to confer with Messrs. Welch, Hosmer, Parker, and Benson of the Office of Operations, SCS, regarding snow surveys on Portneuf River drainage. It is desired to have Mr. Welch, District Conservationist, take over the responsibility of the snow-survey field work on this drainage. The locations of the two snow courses in that area were pointed out to Mr. Welch, and the arrangements with the Forest Service for having them surveyed during the winter months were explained to him. Also, two new courses were laid out - one on Pebble Creek and one on Pink Creek. The former is primarily for the Soil Conservation District and the latter will be of value to the city of Pocatello in connection with its municipal water supply. This will be the first entire tributary drainage area in Columbia Basin upon which the snow survey field work will be handled entirely by the Office of Operations of the SCS.

With the termination of the field work on Portneuf River, Mr. Mitchelson returned to Berkeley and Messrs. Criddle and Marr continued with the snow survey field work. The Teton Summit snow course near Victor, Idaho, was reestablished with the assistance of Mr. Thompson of the Targhee National Forest. The Cottonwood Lake snow course near Afton, Wyoming, was also reestablished and remarked. CCC Camp, FFL2, Dist. 5 snow course south of Afton, Wyoming, was inspected. Stanley Paer, Manager of Wood River Canal Company, and Mans Coffin, Water Master, Big and Little Wood Rivers, both of Shoshone, Idaho, were conferred with regarding the details of forecasting runoff of Big and Little Wood Rivers.

Messrs. Tuttle and Stermitz of Helena, Montana; Paulson of Washington, D. C.; Veach of Tacoma, Washington; Stafford of Los Angeles, Calif.; and Canfield of Portland, Oregon, all of the U. S. Geological Survey, visited our office in Boise to confer on their cooperative snow-survey work with us. These men were in Boise to prepare a report on their activities in connection with the proposed Columbia River Reclamation Project.



Everett H. Davis reports completion of the construction of the snow shelter cabin near Trickle Park in the Grand Mesa National Forest, for use by snow surveyors in handling the Mesa Lakes snow course on the Colorado River drainage, Trickle Divide, Park Reservoir, and Alexander Lake snow courses on the Gunnison River drainage. The cabin was built with a 6-inch concrete foundation, concrete food-storage pit, sub-floor, 5/8 inch drop siding and sealed inside and outside with a combination of asphalt felt and red rosin building paper. The cabin is also equipped with a shallow, dug well and a pitcher pump.

R. A. Work reports: "Final questionnaire forms were sent to snow-survey leaders for distribution in soil conservation districts in western States. These request certain information needed to better apply snow surveys to farming operations of soil conservation districts. Arrangements were made for Frank B. Harper and Robert Branstead of the Portland SCS office to go into the Seven Lakes country to secure color film pictures to be used in a projected national magazine article. By this means, factual data and photographs were secured in both color and black and white of typical snow-survey fall maintenance work, including cabin-stocking procedure.

"An agreement was completed between the Division of Irrigation and the U. S. Forest Service, covering new snow-survey cabin constructed for us by the U. S. Forest Service on Greyback Peak, near Grants Pass, Oregon.

Storage of Water Underground (California) - Fred C. Scobey reports as follows regarding analysis of data on water spreading for Central Valley Project, in Kern and Tulare Counties: "All the daily rates of percolation available have been tabulated and platted on semi-log paper. Of the Kern County ponds, Nos. 1-5 and 6 continue to decline along the same general slope as was noted in previous report; that is, the rate halved about every 16 days. K. P. No. 7 declined at a much faster rate from about 4 feet per day at the beginning of September to only 0.3 foot by September 23. On the other hand, K. P. Nos. 2-4 and 8 had arrived at a rather stable rate and merely fluctuated above and below that rate. For No. 2 this rate was about 0.35 foot per day; for K. P. 4 it was about 1.5 feet per day and for K. P. No. 8 it was between 2 and 3 feet per day, with a gentle continuous recovery. No record for the Kern County ponds as numbered is available for October.

"Of the Tulare County ponds, No. 1 varied slightly above and below 0.15 foot per day; No. 2 recovered from 0.1 to 0.2 foot per day through the month of September. No. 3 had the water turned in again on September 13 and declined rapidly from nearly 2 feet per day to less than 0.5 foot, and held that rate the balance of September. No. 4 had held fairly constant at 0.4 foot per day from August 20 to September 14 when the record stopped. No. 5 held reasonably close to a daily rate of 0.1 foot throughout the month. No. 8 was again placed in commission on September 25 and declined from 5 feet to 3.5 feet in the balance of the record available, up to September 30.



"The new set of ponds near Wasco, designated as Wasco No. 1, etc., followed the usual procedure of an initial recovery soon after starting, perhaps with a sharp decline before this recovery. This extended through September. Through October, the period of decline was evident for all the ponds; two of them reasonably close to our tentative halving in 16 days. The other 6 now being recorded showed variable trends, all slower."

A. A. Young reports his conclusion that characteristic permeability curves derived from experiments with core samples maintained under prolonged submergence show three distinct periods of flow rates:

1. In the initial period there is a short but rapid decrease in flow thought to be due to soil swelling upon saturation.
2. In the second period there is an increase in flow which reaches its peak when a maximum amount of entrapped air has escaped from the soil.
3. The third period is one of long-continued decrease in flow which appears to be influenced by micro-biologic activity. The degree of influence is not yet established. Tests of more than six months show continued declines. In none of the studies of core permeability so far observed has the flow rate reached a constant value.

Dean C. Muckel reports that records from all San Joaquin Valley ponds were collected and tabulated and for those ponds on which the computations had not yet been made, the daily percolation rates were worked up. Copies of tensiometer readings were made and sent to Mr. Christiansen.

Consultations were held with the field observers and some discrepancies were found in their methods of operation now that the rates have become very low and probably accounts for the numerous minor fluctuations in the daily percolation rates. One observer was found to be turning up a meter so as to adjust for a correction he thought necessary. This did not appear on the field notes and was no way to check his computations.

At the suggestion of Mr. Riddell, U. S. Bureau of Reclamation at Bakersfield, one of the Kern County ponds was dynamited in an attempt to break up the hard pan. This treatment was suggested by the fact that all orchards within the general vicinity were blasted prior to the planting of trees. It is reported that this treatment was found necessary to get satisfactory tree growth and penetration of irrigation water. The material encountered when augering to place the dynamite did not appear to be such as would be permanently affected by blasting. However, in view of the orchard treatment, it seemed to be worth a trial.

Mr. Paul S. Jones, Acting Chief, Division of Water Utilization, and Victor Barth, Scientific Aide, Bureau of Reclamation, Sacramento, stopped in Pomona to discuss the San Joaquin Valley spreading program, results being obtained by the field ponds and at the Salinity Laboratory tests were discussed in some detail together with the method of operating certain ponds. One pond has developed a large crack running diagonally across one corner

and there was some discussion as to what should be done. Settlement has apparently caused the crack but there is no evidence outside the pond of any settlement. The land here as far as we have any information, has never been farmed or disturbed in any way. The rate of percolation has been increasing slowly for a couple of months and it was Mr. Muckel's recommendation that the crack be filled with fine soil to see if there will be any change in the rate.

Mr. Muckel made a short stop at the SCS office in San Fernando to discuss the proposed work in Simi Valley, San Jacinto Valley, and Antelope Valley. Later, Mr. Core, Engineer from the Antelope Valley Soil Conservation District, stopped in Pomona and plans were developed for experimental spreading ponds on Kings Canyon cone and at Cottonwood Creek. The City of Los Angeles has given permission to use Owens River Aqueduct water for the test ponds. About 2 second feet is to be experimentally spread at both locations. Plans of spreading basins, measuring devices and means of getting water from the aqueduct by siphoning were laid out.

#### Drainage of Irrigated Land

Carl Rohwer investigated problems of pumping for drainage of Sauvie and Puget Islands in the Columbia River and tidal lands at the mouth of the Skagit River on Puget Sound. This study was made in company with Karl O. Kohler, Jr., and the district engineers of the Soil Conservation Service. Drainage of these lands is dependent on the combined use of tide gates and pumping plants. The important problem is to determine the minimum size of pumping plant that will remove excess water from the lands before they damage the crops.

W. W. Fox reports that a water-use study plot east of Calexico has been established to determine the effect of an irrigation schedule based on soil-moisture sampling, upon the position of the water table, crop production and the salt balance. A system of piezometers has been in place for several months and now one Parshall flume has been set to measure the irrigation water, a meteorologic station has been established and the first set of soil-moisture samples has been taken.

On the Vessey property, where piezometric water table measurements have been under way for about 6 months, an open drain has been dug and observations of the drawdown curve are being made. Permeability measurements on 6 soil samples have been completed, observations on sorption rates of 24 samples were continued all month and 60 sieve analyses and 84 hydrometer analyses were made.

#### Irrigation Institutions

Central Valley Project Studies, Calif. - Wells A. Hutchins reports that the subcommittee of Committee 17 (organizations to which project water shall be sold), appointed for the purpose of drafting a proposed report for the committee, met at Sacramento October 3 and agreed upon the items to be included in the report. Mr. Hutchins was delegated the task of preparing the draft. This was completed, and, with minor changes, has been approved by the other subcommittee members. The approved draft is to be presented in the near future to the full committee for consideration.



Kansas Water-Law Committee - On October 16 and 17, at the request of Chairman George S. Knapp, Mr. Hutchins attended a meeting at Topeka, Kansas, of the committee appointed by Governor Andrew F. Schoepel to study the Kansas laws relating to the appropriation of water. Difficulties in the administration of the Kansas appropriation statute have arisen because of unfavorable decisions by the Kansas Supreme Court. The committee was desirous of having a better understanding of the problems concerning water-law statutes and court decisions of other States, as well as other matters, before preparing its recommendations for needed Kansas legislation. For this purpose it obtained the attendance of several persons whom it asked to present their viewpoints and participate in a general discussion of the subject. The meeting was well attended, and the committee expected to develop its recommendations subsequently.

Hawaii Water-Law Studies - A cooperative agreement between the Department of Agriculture and the Honolulu Board of Water Supply, providing for the making of further studies of the Honolulu artesian-water situation and preparing proposed remedial legislation, has been entered into. On October 26 Mr. Hutchins had a conference in San Francisco with Governor Ingram M. Stainback of Hawaii, with reference to this project and to the report on Hawaiian water laws now in the Office of the Solicitor for review.

Rehabilitation of Irrigation and Drainage Enterprises - J. S. James reports a brief conference in Helena, with personnel of the Montana State Water Conservation Board, which sponsored and now owns many small reservoirs constructed by Federal relief agencies. In many cases agricultural development and guidance and assistance to water users is needed to obtain full value of these State projects. Mr. James says that SCS can meet a need in this work that no other agency can supply. The State program in Montana may also afford opportunities for research and the interpretation of research results, as well as operations service. The research possibility will be explored with State College authorities at first opportunity.

Mr. James met Mr. Wells and Mr. McLaughlin at Worland and accompanied them to Billings. Trips were made during the month in company with SCS personnel, to look into the irrigation and drainage problems of various soil-conservation and irrigation districts, some of which are considerably complicated. In one of these investigations the possibilities of using bentonite to waterproof stock ponds and irrigation channels were looked into. A large deposit of this material is available along the highway near Tonsleep. Mr. James is in search of further information on the effectiveness of bentonite, as assembly and interpretation of such information would be of particular value in the Tonsleep area.

## Applied Research

### Water Conservation

Evergreen Soil Conservation District, Calif. - Paul A. Ewing reports that a preliminary investigation was made with Harry F. Blaney on the water-conservation plan of the Evergreen Soil Conservation District. A conference was held with William C. Scott, District Conservationist, and Carl M. Forsberg, District Engineer, at San Jose. They also conferred with



G. W. Hunt, Engineer for Santa Clara Valley Water Conservation District. A field inspection was made of the district and the proposed reservoir and dam sites for conserving water for irrigation of deciduous orchards and vineyards. A brief report was prepared to indicate the nature and scope of assistance that might be contributed by the Division of Irrigation to the anticipated studies involved in the plan. Principal conclusion was that the studies should be concentrated initially on the sufficiency of the proposed water supply, which is somewhat doubtful.

Portland Conference - Edward C. Gwillim reports the meeting of SCS personnel for discussion of the responsibilities of the Division of Irrigation in connection with water-conservation projects. Homer M. Wells, Chief of the Water Conservation Division, T. L. Gaston, Assistant to the Chief, SCS, and W. W. McLaughlin, Chief of the Division of Irrigation, led the discussion. A tentative outline had been prepared, setting up the responsibilities of the Water Conservation Division and leadership for carrying them out. Suggestions and revisions were discussed with the regional chiefs of the Office of Operations. (Mr. Wells and Mr. McLaughlin held similar meetings in other SCS regions.) The responsibilities as outlined are revisions of the Water Conservation Division's responsibilities as outlined at the July meeting in Denver.

Following the Portland meeting, Mr. Gaston, Mr. McLaughlin and representatives of the Portland Regional Office attended a meeting of the Soil Science Society of Oregon, at which Mr. McLaughlin discussed the Economic Feasibility of Reclamation Projects, and Mr. Gwillim discussed the Engineering Feasibility of Reclamation Projects. Both discussions were impromptu.

#### Miscellaneous Notes

D. W. Bloodgood attended a meeting that concluded with the organization of the Texas Water Conservation Association. Directors elected represent irrigation, navigation, river authority, industrial, and municipal developments throughout the State.

12/13/44

